Development, Implementation and Analysis of Crop Yield Prediction Model using AI for farmers

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Development, Implementation and Analysis of Crop Prediction Model using Artificial Intelligence for farmers

Abstract

The traditional farming practices, creating a background where every conclusion is informed, considered and modified to the specific needs of the crop. Agriculture is a fundamental factor that has a major role in beneficial the rising and increasing growth in population. In the direction of remain promptness with the growing demand for crop, farmers require to formulate the best use of them to collect production while minimizing losses. Information Technology is that the area of running technology and spans a good sort of areas that include and adapting emerging technologies in agriculture. Emerging technologies utilized artificial intelligence, Geographic Information Systems (GIS), image processing, computer vision, Global Positioning Systems (GPS), techniques enhanced for the precision agriculture and successfully minimize inputs, effort, and time sustainably, improved efficiency and profitability. It leverages elevated digital technologies and will play a major role in the modern farming revolution.

Artificial intelligence offers remarkable abilities to study huge amount of information which will be helping and enabling farmers to make decisions for optimized crop production. This study considers into the challenges, key methodologies, and a capable outcome associated with artificial intelligence develops, implements and do analysis of crop prediction model which is probable to agriculture and to reform the opportunity of Precision Farming.

Keywords: Information Technology, Artificial intelligence, Precision agriculture, Crop Prediction.

1. Introduction

The traditional farming practices, creating a background where every conclusion is informed, considered and modified to the specific needs of the crop. Agriculture is a fundamental factor that has a major role in beneficial the rising and increasing growth in population. In the direction of remain promptness with the growing demand for crop, farmers require to formulate the best use of them to collect production while minimizing losses. Information Technology is that the area of running technology and spans a good sort of areas that include and adapting emerging technologies in agriculture. As a tool for direct contribution to agricultural productivity and as an indirect tool for empowering farmers to require informed and quality decisions which can have positive impact on the way agriculture and allied activities are conducted.

Precision farming is performing major role in agriculture field which extensively uses information technologies to form direct contribution to agricultural productivity. Technologies, geographical information systems, and agronomy and soil sciences are wont to increase the agricultural output. This approach is capital intensive and useful where large tracts of land are involved. Consequently, it's more suitable for farming haunted on corporate lines. The indirect benefits of IT in empowering Indian farmer are significant and remain to be exploited. The Indian farmer urgently requires timely and reliable sources of data inputs for taking decisions. At the present, the farmer depends on trickling down of decision inputs from conventional sources, which are slow and unreliable. The changing environment faced by Indian farmers makes information not merely useful, but necessary to stay competitive.

2. Literature review

Sr.No.	Book name/Paper name, Author names, Publishing year	Outcomes
01	In the book , Technologies for global climate change adaption. Rebecca Clements, Jeremy Haggar, Alicia Quezada, Jaun Torres 2017	In this book author outcomes defined is sort of unpredictable weather, floods etc may impact on agriculture
02	In the International journal of scientific research in computer science applications and management studies, Artificial intelligence in agriculture: A Literature survey paper author Gouravmoy Bannerjee, Uditendu Sarkar, Swarupa Das, Indrajeet Ghosh ,Journal volume 7,issue 3, 2018	In this paper authors outcomes enlist on pest, disease, Soil management and mainly on yield prediction and also covering the systematic survey on all management levels used in agriculture sector.
03	In the Taylor & Francis online journal paper, An interdisciplinary approach to artificial intelligence in agriculture, author Mark Ryan, Gohar Iskahanyam & Bedir Tekinerdogan, 2023	In this paper innovations using the digital technologies like artificial intelligence promoted for growth in agriculture sector, also survey based outcomes studied on impact of artificial intelligence in agriculture.
04	In the Journal of applied sciences ,Rosana Cavalcante de Oliveira,Rogerio Diogne de Souza e Silva in, 2023	In this paper used of artificial intelligence, computer vision & machine learning technologies perceptively used in agriculture.
05	In Artificial Intelligence Techniques in Smart Agriculture book by Siddharth Singh Chouhan, Akash Saxena, Uday Pratap Singh, Sanjeev Jain, 2024	The obstacles in technology based agriculture methods and technology, digital platforms towards artificial intelligence.
06	In Perspectives of Artificial Intelligence in Agriculture Hardcover book by Dr. Harvinder Kaur Sidhu (Author), Dr. Harmaninder Jit Singh Sidhu, 2023	The outcomes from this book are utilization of the new technologies in the agriculture sector for increasing the growth.

07	In Artificial Intelligence in Agriculture: Opportunities, Risks, and Future Perspectives book,by R,K Naresh,Pushpendra kumar,J.P Singh,Rajan Bhatt,Yogesh Kumar,R.K Gupta,S.K Tomar,S.K Gupta,2023.	The author illustrate that prediction and Challenges of the Internet in digital farming based on AI & IoT applications and techniques in supportable and Precision Farming
08	In Digital agriculture book by P. M. Priyadarshan, Shri Mohan Jain, Suprasanna Penna, Jameel M. Al-Khayri,2024.	In this book the most recent advances in AI-integration of agriculture practices. detailed focus includes but not limited to, yield mapping, pests management.

I have studied and reviewed the above papers in literature review, I found that currently no one author did the research on crop prediction development of mobile application for farmer. Crop prediction analysis study is still pending.

3. Statement of Problem

Government and industrial sector working together for crop yield production model using artificial intelligence for advice to the farmer about temperature, pesticides, rainfall, and soil fertility are the major factor considers for predicting the crop yield. These factors are consideration in our research study focused on to develop the crop prediction model using artificial intelligence.

4. Objectives of the Research

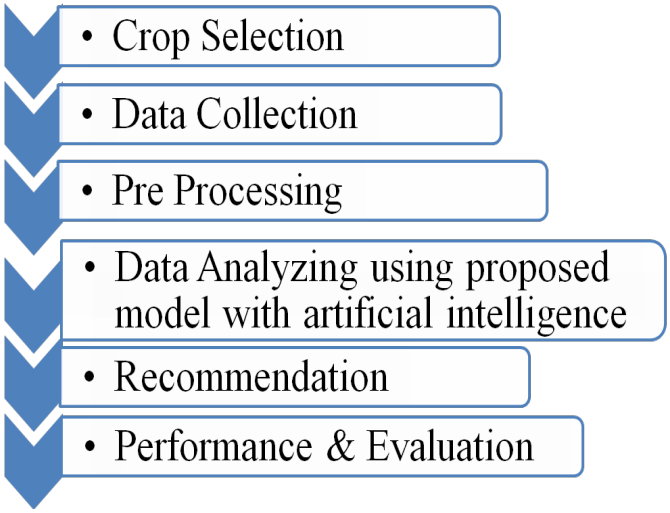
Following are the main objectives of the research:

1. To develop and propose model for to measure the precision level of agriculture land using artificial intelligence.
2. To Predict and validate fertilization of plant.
3. To conduct a comparative critical analysis for to measure the performance of the proposed crop prediction model with existing model.
4. To Develop mobile application for farmer's agriculture insights.

5. Research Methodology

The collections of technologies utilized in agriculture point of view are Global positioning system used for monitoring crop survey and Geographic information systems take course of action for decisions, artificial intelligence system. In this study using the emerging technologies which are perform major role in precession agriculture development.

Following flow chart shows the research methodology ~~way~~:


• Crop Selection
• Data Collection
• Pre Processing
• Data Analyzing using proposed model with artificial intelligence
• Recommendation
• Performance & Evaluation

a) Crop Selection: The purpose of crop selection is to choose the maximum initial crops that enhanced farmer goals, regularly increase their profits. In specific boundaries like soil circumstances, local weather, and available equipments.

b) Data Collection: Agricultural data collection included large in order to linked farming actions and crop strength. The usual methods of collecting data are the surveys based which are included interviews, Observation, and questionnaires but now currently used automated data collection tools like web-scraping. This data collection method from all online sources, such as websites and traditional way for data gaining is used for sample.

c) Pre Processing: An initial phase of data for handling out to organize and arrange it for the initial processing stage and for further analysis.

d) Data analyzing: The data collection method from all online sources, such as websites and traditional way also adopted for sample collection. Predictive data analysis helps farmers to make better decisions to crop.

e) Recommendation: Artificial intelligence helps farmers by effective crop gaining method, such as growing the quality of the soil and chooses the best time to plant their seeds.

f) Performance & Evaluation: The top practices are measured after analyzing the data. Data is collected from sensors in the sector. They predict farmers about crop health, soil conditions, and weather. This predicted way helps them consider the correct conclusions and increase precision agriculture way.

6. Significance of Study

India is an agricultural country, 70% of peoples depends upon directly and indirectly on agriculture, but farmers ~~are~~ suicide is a worrying condition for the India. The following are the reasons behind the farmers suicide.

a) Cost of agriculture equipments
b) Lack of knowledge of direct integration with market.
c) Labor cost,
d) Climate change,
e) Bank loans,
f) Lack of awareness of soil fertility and crop yield.

7. Proposed Work Plan

Activities	Year		
	(2023-24)	(2024-25)	(2025-27)
Literature Survey			
Understanding way for Problem Solving			
Data Collection			
Study parameters required for implementation			
Develop A Methodology for Prediction			
Development and Analysis of application			
Writing Research Articles			
Submitting Research Articles to Professional Journals.			
Pre- Ph.D. Synopsis Submission			
Thesis Writing, Thesis Submission			

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